

FL40
Iso 5167 mass flow computer
Installation and user manual
rev. 12/2015

PRELIMINARY INFORMATION

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Technical help

If you find problems with the instrument, check its configuration to be coherent with the application. If still it persists the problem, help can obtain by the following media:

e-mail arian@arian.cl
phone/fax 56-2-2418333
web www.arian.cl

Revision history

rev. 11/2005	First release.
rev. 08/2007	Added functionality for totalized flow count disable
rev. 07/2009	Modified cut-off function on pag 17.
rev. 10/2015	Optional outputs pag 21.
rev. 12/2015	Mass and volumetric flow rate.

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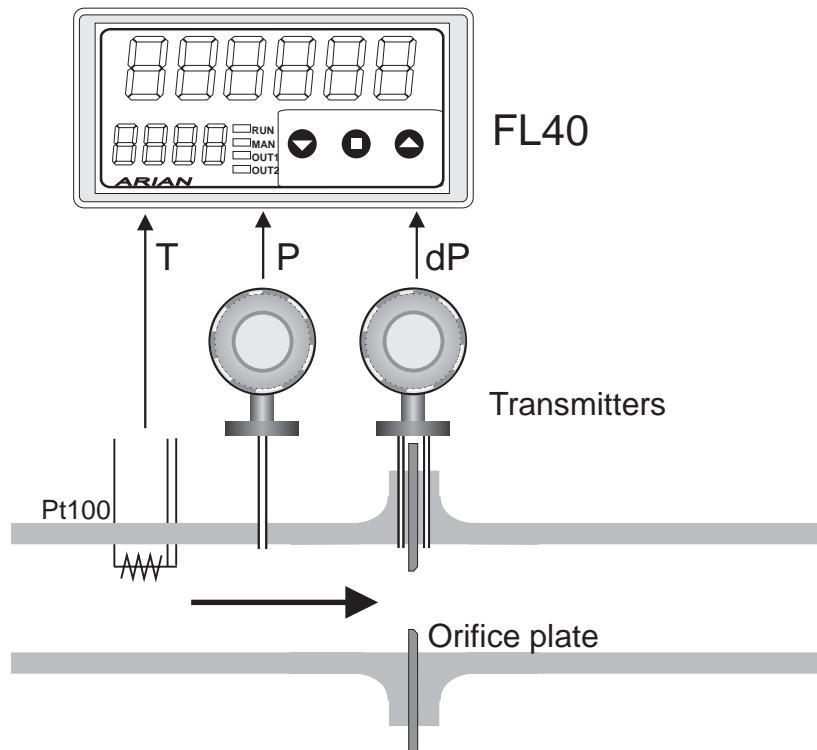
GENERAL DESCRIPTION

The FL40 is a multivariable flow computer and Cad software designed specifically to be used on differential pressure flow measurement devices under ISO5167 standard such as orifice plates, nozzles and venturi tubes. Differential pressure measurement on the primary device is corrected with upstream pressure and temperature of the fluid in order to calculate instantaneous mass flow .

Arian Flow Cad software allows to select the fluid within a list, describe the primary device and calculate discharge coefficients, expansion factor and fluid properties under flow conditions.

Results are stored on a file and downloaded to the FL40.

<i>Inputs</i>	- Standard process variables as 4..20mA, 0..10V,etc. for P , dP and T - Pt100 or thermocouples for Temperature input. - Two programmable external inputs (dry contact) as reset functions.
<i>Readings</i>	- Totalized flow in 6 high bright 14.5mm height red digits. (Upper display) - Flow rate in lower 4 digits. - Continuous memory, stores last reading of the totalized flow. - Registers maximum and minimum readings of flow rate.
<i>Alarms</i>	- 4 alarms assigned independently to preset values of the totalized flow or rate, linked to the 2 output relays, - Latch and standby functions.
<i>Outputs</i>	- Two output relays, with two programmable alarms each (high and low) - Output pulse with frequency proportional to the analog input. For external totalizing in PLCs. - Galvanically isolated analog outputs for the flow rate meter: active loop 4..20ma ,0...10V, passive loop 4..20ma.
<i>Communications</i>	- RS485 Modbus RTU serial communications reports data to a PC or PLC.
<i>Configuration.</i>	- From a PC compatible by means of RPS software. - From frontal push buttons.



PART CODE

Defining a part number must be done selecting the following options.
Last 2 ones (-420A, -420L), -RS85 are optional that must not be included if no required.

FL40	-AC -DC	-420A -420L	-RS485
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-AC :power supply 85...260 Vac, 6 W, 45...65 Hz.
-DC :power supply 18....60 Vdc, 6 W

OPTIONAL OUTPUT
-420L :4..20ma passive loop
-420A :4..20ma active, includes also 0..10Vdc

OPTIONAL
-RS485 :modbus RTU serial communications

For example:

FL40-AC
FL40 , AC power supply , without any optional output.

FL40-DC-RS485
FL40 , DC power supply and modbus RTU serial communications.

TECHNICAL SPECIFICATIONS

INPUTS	3 inputs for P, dP and T: Pt 100, thermocouples, 4...20 mA, 0...20 mA, 0...5 V, 1..5 V, 0..10 V, 0..50 mV.
DISPLAY	Flow totalizer: 6 digits Display (14mm), range 0...999999 Flow rate: 4 digits (9mm), range -999... 9999
OUTPUTS:	Relays, 2 outputs for alarms 250VAC/ 3A., normally open or normally close by software.
Optional:	-420L 4... 20 mA, loop powered, Vdrop 4.5V max. opto isolated (5kV). -420A 4..20ma Active loop, opto isolated (5kV). -010V 0.. 10Volts, opto isolated (5kV). -RS485 modbus RTU serial communications, opto isolated (5kV).
POWER SUPPLY:	Current mode switching power supply. Versions: 85...260 Vac, 6 W, 45...65 Hz. 20...60 VDC, 6 W, (optional)

CONSTRUCTION:	Aluminum and Polycarbonate; IP65
Total Dimension:	DIN 1/8; 96 x 48 x 180 mm.
Panel cut:	92 x 45 mm.
Weight:	350 grams.
Operation temperature:	0 ... 50 °C.

INSTALLATION

Analog inputs.

Analog inputs for T, P and dP are show in the drawing. Terminals #3 and #12 are connected to the instrument internal ground and can used for the connection of external shield of sensors cable.

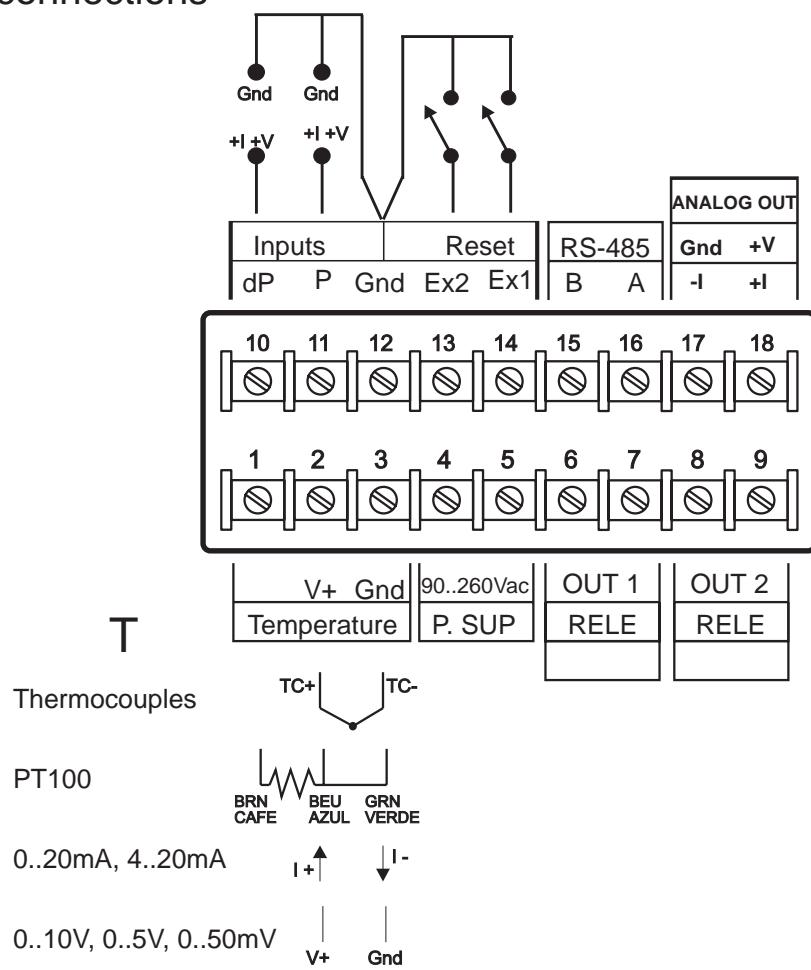
The internal pins that set the input types for T, P, dP are described on the next page drawing. This is must be done opening the instrument before panel mounting. Just remove top part half of the cage, without removing screws.

Cables that bring the sensors signals be apart from cables connected to the output relays since this are normally inductive loaded. When deactivated this relays can generate high voltage spikes that can cross the cable insulator and disturb, even damage the input circuit.

External reset inputs.

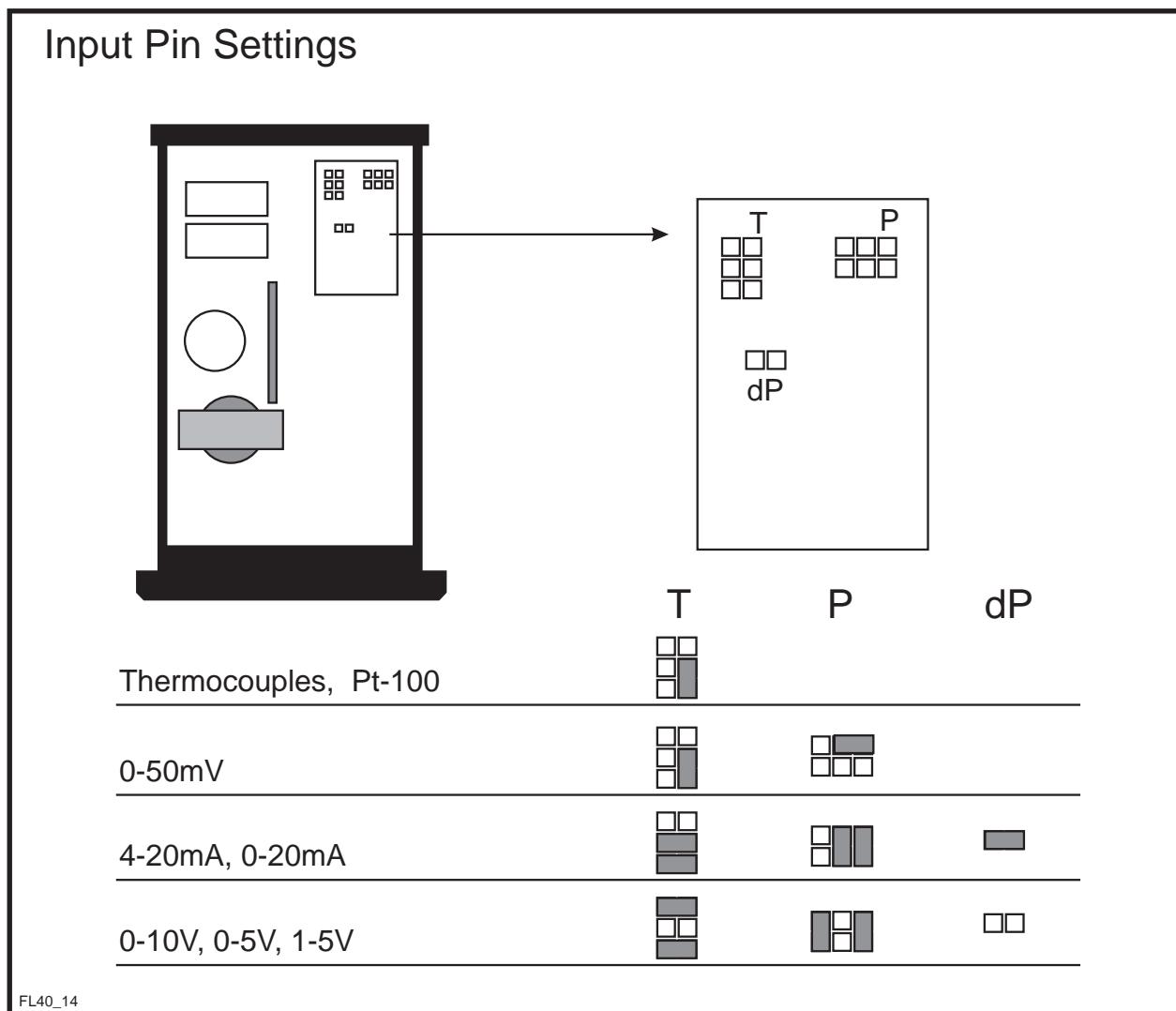
The instrument haves 2 external inputs for connecting push buttons or switchs. In the configuration menu is assigned a function to the inputs, such reset total to cero, reset registered maximum and minimum. Switchs are connected to terminals #14, #13 and #12 (Gnd)

FL40 connections



FL40_c1

Input Pin Settings



Alarm outputs

Relays are the standard option for alarm outputs. As seen in the figure, relay for alarm 1 (OUT 1) goes to terminals 6 and 7. The one for alarm 2 (OUT 2) to terminals 8 and 9, both are normally open outputs (NO). Care must be taken on not exceeding the maximum relay current (3 Amp.), since they would be damaged quickly. Is recommended to use fuses in series with the relays to protect them. Never use directly the internal relay with the load. Always a external contactor should be used to drive the final load.

Analog outputs (optional)

For isolating and retransmitting the measured variable to a PLC or another instrument. If this options are installed please refer to "analog output configuration" chapter for details.

RS485 serial communications. (optional)

For communicating with PC or PLC using modbus RTU software protocol. This is an isolated out that drives standard RS485 5Volts signals. If this options are installed please refer to "RS485 communications configuration" chapter for details.

Power supply

The instrument power supply is designed to operate with any voltage between 90 and 260 volts without need of adjustment. (20VDC to 60VDC for the DC power supply option). Once start up will continue operating unless the network fall under 50 VAC. The instrument possesses an internal 0.5Amp fuse that should be replaced with a similar one.

Panel assembly

Designed for panel assembly in a 92 x 45 mm. cut (Format DIN 1/8) using clamps included with the instrument.

CONFIGURATION FROM PC (RPS)

Two displays versions may be programmed by frontal push bottoms while one display versions does not have push bottoms, so only can be programmed from a PC compatible computer. The following is needed:

- The PC compatible computer with vga monitor.
- RPS software (download latest version from www.arian.cl)
- Isolating interface cable. Part# RPS-C

While using the RPS system the configuring menus are the same described in following chapter for frontal push bottoms programming.

With de-energized instrument, the interface cable must be connected by one side to the internal connector as shown in the picture.

The other side of the cable goes to the PC serial RS232 port (DB9). Once done the connection the instrument must be energized and RPS software executed in the PC.

The interface cable does optical isolation between PC and instrument. Concluded the programming you must de-energized the device and then plug off the interface cable.



CONFIGURATION

Operation form must be programed on this configuration menu.

IMPORTANT NOTE:

Once entering on this menu the FL40 stops computing flow and will continue only when you exit the menu and return to the operation mode.

To enter the configuration menu press the center button [•] and without releasing it, press and release one time the "right or upper" button [^]. Doing that, the message "KEY" will appear in the upper display. At this moment the instrument asks for a access key. Now the number 2736 should be introduced in the lower display using the "left or lowering" and "right or upper" button. Once the number 2736 is in the lower display, press the button [•] to enter.

Now in the upper display appears the message **M E n u**. With the lateral buttons select one of the 5 menus and to press center button [•] to enter. To quit, select the option "SALi" or wait 16 seconds without pressing any button.

M E n u

O P E r. General menu, configuring displays, operation modes and other options.

I n P t. Analog inputs configuration.

A L - 1 alarm 1 configuration.

A L - 2 alarm 2 configuration.

4 - 20. analog output, 0...10V, 4...20mA (if it is available)

r 4 8 5 rs485 serial communications.

S A L i Returns to operation mode.

Once entering one of the menus, if no button is press in 16 seconds, the devices returns automatically to operation mode.

At the end of each menu, always is asked if is desired to program the new data and then to quit or continue configuring. These questions are presented as:

P r o g is asked if is desired to program or not the instrument with the introduced values. Selecting "No", values recently placed will be erased and original values will not change.

N o Do not program new values.

S i Set in EEPROM new values.

S A L i Select "Si" for quit (exit) the menu and "N o" for returning back to the starting of the actual configuration menu.

N o Continue in this menu.

S i Quit or exit the menu.

General Configuration menu (O P E r).

<u>d i s . A</u>	Select the reading for the 6 digit upper display.
<u>M. t o t</u>	Totalized mass flow.
<u>V. t o t</u>	Totalized volumetric flow.
<u>M. r t E</u>	Mass flow rate.
<u>V. r t E</u>	Volumetric flow rate.
 <u>d i s . b</u>	 Reading for the lower 4 digits display.
<u>o F F</u>	Disabled Display.
<u>M. r t E</u>	Mass flow rate.
<u>V. r t E</u>	Volumetric flow rate.
<u>M A C S</u>	Mass flow rate maximum.
<u>M i n i</u>	Mass flow rate minimum.
 <u>P. d i . C</u>	 Places a fixed decimal point in the 6 digit higher display. This apply only when the reading is the totalized flow. - - - - Without decimal point. - - - . - - - . - - . - - - -
 <u>P. d i . M</u>	 Sets the number of decimal places for the mass rate reading. Applies for upper and lower displays.
 <u>P. d i . V</u>	 Same as above, but for the volumetric rate reading.
 <u>E t r.1</u>	 A function is assigned to the external reset input 1, associated to terminal #12. <u>o F F</u> there is no function assigned. <u>r S t . N</u> Reset registered maximum and minimum of rate. <u>r S t . A</u> Reset latched alarms. <u>d i . A L</u> Disable/restore momentarily the alarm relay outputs. While disabled the alarms, the "RUN" led on front panel blinks quickly. <u>r S t . C</u> Reset to zero totalized flow.
 <u>E t r.2</u>	 A function is assigned to the external reset input 2, associated to terminal #13. Options are the same described for previous case.
 <u>b o t . L</u>	 Special function set for the Lowering button [v] on the front panel. (the left one). Options are the same described for previous case.

b o t . H

Special function set for the "high" button [^] on the front panel (the right one).

Options are the same of the previous one.

F u . L c

= No, Si

Special functions lock.

It should be set "Si", to restrict operator access to "F u n c" special functions menu (e.g.. reset maximum, minimum, alarms, etc.) as described in operation chapter.

P r o g

= No, Si

Set "Si" for programming new data. Otherwise data will be lost when quitting this menu.

S A L i

= No, Si

Set "Si" for quitting this menu. Otherwise return back to its starting point.

Input configuration

Previously must been set the **input configuring pins** (for Pt100, Tc, current or voltage inputs) as described in the installation chapter.

Characterization of the fluid properties and primary device for the expected operating ranges is done with the **Arian Flow Cad software**.

As result the software generates a configuration file (extension .sfg) containing the selected characteristics and operating ranges.

The configuration file is then loaded to the instrument using the RPS programming software.

Take the *.sfg configuration file that is generated by ArianFlowCad in the same directory of the project file and place a copy of it in "files" subdirectory of the RPS software.

Then run RPS software with the FL40 connected to the PC and go to Menu / Device / FileWrite.

After loading the configuration file to the FL40 go on with the following input configuration menu in the same RPS software for setting options related with sensors types you will use.

Upstream temperature input

t . t Y P Up stream Temperature Input type.

t c thermocouple input
P100 RTD type Pt100 DIN43760 (-136, 450) C.
PrcS processes input 4-20mA, 0-10Volts and others.

Depending on selected input type, internal jumpers must be placed as described on installation chapter.

Selecting input as thermocouple t c or pt100 P100 , the instrument will pass to ask for temperature units.

While, if selected process variable input PrcS , the instrument will ask for the limits or input calibration.

t Y P E Thermocouple type.

If select thermocouple input, now is set the type and temperature units.

Type	RANGE
<u>t c J</u>	J (-60, 760) C.
<u>t c k</u>	k (-100, 1372) C.
<u>t c t</u>	T (-86, 400) C.
<u>t c r</u>	R -1 mV, 1767 C.
<u>t c s</u>	S -1 mV, 1764 C.
<u>t c b</u>	B -1 mV, 1815 C.
<u>t c n</u>	N (-139, 1298) C.
<u>t c E</u>	E (-176, 750) C.
<u>t c PL</u>	Platinel (0, 1394) C.
<u>t c C</u>	C (0, 2314) C.
<u>t c d</u>	D (0, 2314) C.
<u>t c G</u>	G (0, 2313) C.

t Y P E

Processes input type for Temperature input.		
	Type	Range
<u>0 - 20.</u>	0- 20 milliamperes.	-24 mA, 24 mA.
<u>4 - 20.</u>	4- 20 milliamperes.	2 mA, 24 mA.
<u>0 - 5 v.</u>	0- 5 volts.	-2 V, +12 V
<u>1 - 5 v.</u>	1- 5 volts.	-2 V, +12 V
<u>0 - 10.</u>	0- 10 volts.	-2 V, +12 V
<u>0 - 50</u>	0- 50 millivolts.	-10 mV, +60 mV

L. i n F

= -999... 9999 Celsius degrees

Introduce reading value for input at the lower limit of selected input type.

For example the input is 4-20mA originated in a temperature transducer that delivers 4 mA at 0 C and 20 mA at 1000 C

In this case is being asked for the reading at 4 mA, that is LinF = 0.

L. S u P

= -999... 9999 Celsius degrees

Introduce reading value for input at the higher limit for selected input type.

For the same previous example, it is asking for reading at 20mA input, that is LSuP = 1000.

t . d i S

= [oFF , on]

Enable or disable temperature measurement.

In case on , the fixed default temperature is used for internal calculations.

t . E r r

= [oFF , on]

Enables use of the default temperature for internal calculations when the temperature sensor fails. In that case no error will be given for flow rate.

t . d E F

= -200,... 2000 Celsius degrees

Default temperature to be used for computations.

Upstream pressure input

P . t Y P

Upstream pressure sensor input type.

	Type	Range
<u>0 - 20.</u>	0- 20 milliamperes.	-24 mA, 24 mA.
<u>4 - 20.</u>	4- 20 milliamperes.	2 mA, 24 mA.
<u>0 - 5 v.</u>	0- 5 volts.	-2 V, +12 V
<u>1 - 5 v.</u>	1- 5 volts.	-2 V, +12 V
<u>0 - 10.</u>	0- 10 volts.	-2 V, +12 V
<u>0 - 50</u>	0- 50 millivolts.	-10 mV, +60 mV

P . d i S	= [oFF , on] Enable or disable pressure measurement. In case <u>on</u> , the fixed default pressure is used for internal calculations.
P . E r r	= [oFF , on] Enables use of the default pressure for internal calculations when the sensor fails. In that case no error will be given for flow rate.
P . d E F	= 0... 100 % Default upstream pressure to be used for computations. Is entered as percent of the range set for the sensor in the Arian Flow Cad software.

Differential pressure input

d P . t Y	Differential pressure sensor input type.	Type	Range
<u>0 - 20.</u>	0- 20 milliamperes.	-24 mA, 24 mA.	
<u>4 - 20.</u>	4- 20 milliamperes.	2 mA, 24 mA.	
<u>0 - 5 v.</u>	0- 5 volts.	-2 V, +12 V	
<u>1 - 5 v.</u>	1- 5 volts.	-2 V, +12 V	
<u>0 - 10.</u>	0- 10 volts.	-2 V, +12 V	
<u>0 - 50</u>	0- 50 millivolts.	-10 mV, +60 mV	

Flow totalizer

The FL40 measures and totalize both mass a volumetric flow rates simultaneously. The totalized flow is actualized adding each second the instantaneous flow rate to the last totalized flow.

The reading is presented in the higher 6 digits display and is obtained by dividing the internal totalized flow value by a constant k.cnt that allows to adjust for different engineering units.

For example the flow rate is 500kg/hour.

If the input is stable, each second 500 is added to the internal totalized. If the input is the same for one hour, then 500 had been added 3600 times.

So the totalized had increased 1800000.

If you want to have the totalized reading in kg, you must divide by k.cnt = 3600.

This way if you reset the instrument and let it work 1 hour with the constant 500kg/hour flow rate, the reading will be 500Kg.

$$(500\text{kg}/\text{hour} \cdot 3600) / [3600] = 500$$

In order to have the reading in kg with one decimal point (e.g. 100.3kg), then you must divide by 360 (so reading would be 5000 in stead of 500) and also activate the decimal point as indicated in the general configuration menu.

The division constant k.cnt may have any value in the range of 0...999999.

From the RPS software is entered as a 6 digit number, but from the instrument frontal push-button is entered in 2 parts, first the 4 less significant digits and then the 2 most significant in order to have a 6 digit number.

Mass totalizer division constant:

M. kt. 4 = 0... 9999 4 less significant digits

M. kt. 2 = 0... 99 2 most significant digits.

Volumetric totalizer division constant:

V. kt. 4 = 0... 9999 4 less significant digits

V. kt. 2 = 0... 99 2 most significant digits.

t. Inh = Off, On Totalized count inhibition enable.
If enabled, each second the flow input is compared with the number set as F.Lin if lower then the totalized count update is not done.

F. oFF = Off, On Flow cut-off enable.
If enabled, the flow is compared with the number set as parameter F.Lin if lower then the flow is set to cero. This is a lower limit for the input. Use it for example if you don't want to have input negative values (set F.Lin =0).

F. Lin = 0... 9999 Flow rate lower limit.
Input lower limit used when enabled some of the 2 preceding options.

Finally from the push buttons you must set

P r o g = No, Si
Set "Si" for programming new data. Otherwise data will be lost when quitting this menu.

S A L i = No, Si
Set "Si" for quitting this menu. Otherwise return back to its starting point.

Alarms configuration.

The FL40 possesses 2 independent alarms (alarm-1 and alarm-2) each one associated to a output relay (relay-1 and relay-2)

This alarms can be associated to the flow rate or to the totalized flow readings independently.

Each one of the alarms (alarm-1 and alarm-2) haves 2 Set Points, high and low. The alarm will activate when the input passes one of these limit.

Once the alarm condition is set, the upper display will operate intermittently indicating that this condition exists.

Both Set Points (high and low) for each alarm possess programmable hysteresis and can be defined as absolute value or relative (displacement) to a common Set Point.

Now is described the configuration for alarm-1.

Configuration of alarm-2 is similar.

A L A r

Selects the variable associated with alarm 1.

r A t E flow rate

C n t r totalized flow

Depending on the selected option the alarm operation form varies.

IMPORTANT

Selecting C n t r disables Latch and Standby functions. Also will be not available the d o n F option for high and low alarms.

When r A t E is selected, then the following parameters are required.

H i g h

High set point for alarm-1.

o F F Disabled.

o n F h On/off with hysteresis high alarm. The alarm activates when input is **higher** than a value programed in the parameters menu.

d o n F Dual on/off type high alarm. The alarm activates when input is **higher** than a value defined by general Set Point "SP. rE" **plus** a displacement programed in the parameters menu.

L o w

Low set point for alarm-1.

o F F Disabled.

o n F h On/off with hysteresis high alarm. The alarm activates when input is **lower** than a value programed in the parameters menu.

d o n F Dual on/off type high alarm. The alarm activates when input is **lower** than a value defined by general Set Point "SP. rE" **minus** a displacement programed in the parameters menu.

L t c h

Enable Latch alarm.

If enabled, the alarm condition output will be maintained although the condition that generated it disappears.

Operator must reset the latched alarm from the front panel.

No disable

Si. enable

S t b Y

The "standby" function inhibits alarm activation when the operator changes the Set Point or the instrument is powered up.

If alarm condition is given in that situation, the activation of the alarm-1 is inhibited until the condition that generates the alarm disappears.

After the condition that generates the alarm disappears (eg. the rate reading arrived to the new set point) then the alarm is ready to be activated by normal operation.

No disable

Si. enable

r E L E

Is specified if the relay-1 will work normally open or normally closed. This relay is active when alarm-1 condition exists.

d i r Relay works direct , normally open.

i n v Works inverted or normally closed.

P r o g

= No, Si

Set "Si" for programming new data. Otherwise data will be lost when quitting this menu.

S A L i

= No, Si

Set "Si" for quitting this menu. Otherwise return back to its starting point.

Alarm 2 and pulses output.

Alarm 2 is configured in identical way that is done for alarm 1, but the output is related to relay 2.

The only difference is an additional option for emitting pulses with the relay for external counting. Pulses rate are proportional to the analog input. This way pulses can be counted in a PLC.

Once entering Alarm-2 configuration menu the following is requested.

A L A r

Selects operation form of the alarm a relay.

r A t E alarm set to the flow rate.

C n t r alarm set to the totalized flow.

P u L S Pulse output on relay-2

Depending on the selected option the alarm operation form varies.

Selecting r A t E or C n t r makes this alarm to operate the same way as described for alarm-1. If P u L S is selected the output pulses on relay-2 are enabled and the following is requested.

P.C t E

= 1... 9999

Division constant for output pulses.

Each second it is evaluated how much the totalized flow is increased. A pulse will be emitted for increase equivalent to the division constant. The pulses will be emitted by relay-2 in the following second.

For example if the flow rate is 500kg/hour and the flow totalizer prescale is k.cnt = 3600, then the totalized will be in kg.

Each unit the totalized flow increases is equivalent to 1kg.

If you need now that the instrument send 1 pulse for each 100kg increase, then set the output prescale P.C t E = 100.

Same way if you need 1 pulse for each kg, set P.C t E = 1.

The maximum number of pulses that can be emitted by second is 100, but if the output relay is mechanical type (there is the option for SSR Relay) no more than 4 pulse per second should be allowed because of speed response limitation of the relay. For this reason the maximum expected input rates must be considered when you set the constant.

Emitted pulses are always 50% duty cycle. If one pulse/second is emitted the relay will be 0.5 seconds active and 0.5 second deactivated.

If 4 pulse seconds are emitted relay will be 0.125s active and 0.125s deactivated.

Analog output configuration 4-20 mA. or 0-10V

This output is optional, the configuration menu is in all instruments even if the optional output board may be not installed.

There are 3 analog output types, all of them galvanically isolated.

Option -420LP, is 4-20ma loop Powered that requires a voltage source in series with the loop. Its typical use is conditioning and isolating process variable for other instruments as eg. PLC or DCS.

Option -420AC, is 0-20mA or 4-20mA , active output. Its used to send the selected variable to instruments whose input should be active (powered) such as a 4-20ma loop powered valve.

Option -010V, is a 0.. 10Volts output.

Questions in the menu will vary slightly according to board type installed.

Option -420LP

<u>4 - 20</u>	<u>o F F</u>	Disable output.
	<u>o n</u>	enabled.

Option -420AC

<u>t Y P E</u>	<u>o F F</u>	Disabled.
	<u>0 - 2 0</u>	0 to 20 mA.
	<u>4 - 2 0</u>	4 to 20 mA.
	<u>0 - 1 0</u>	0 to 10 Volts.

V A r b

Asks by the variable that will be transmitted. See in the following page the table for the possible analog output variables.

E. i n F

= -999... 9999

Introduce the value of the selected output variable for which the output will deliver 4 mA. (or 0 Volts). For example if output for input temperature was selected, when "E. i n F" = 0, the output will be 4 mA for zero degrees temperature. For lower temperatures the output will descended down to 3.5 mA. aprox.

E. S u P

= -999... 9999

Introduce the value of selected output variable for which the output will deliver 20 mA. (or 10volts). For the same example, place "E. S u P" = 1000, then the output will be 20 mA when temperature is 1000. For higher temperatures the output will rise up to 20.5mA.

C A L i

This refers to output board calibration, is reserved for manufacturer use.

P r o g

= No, Si

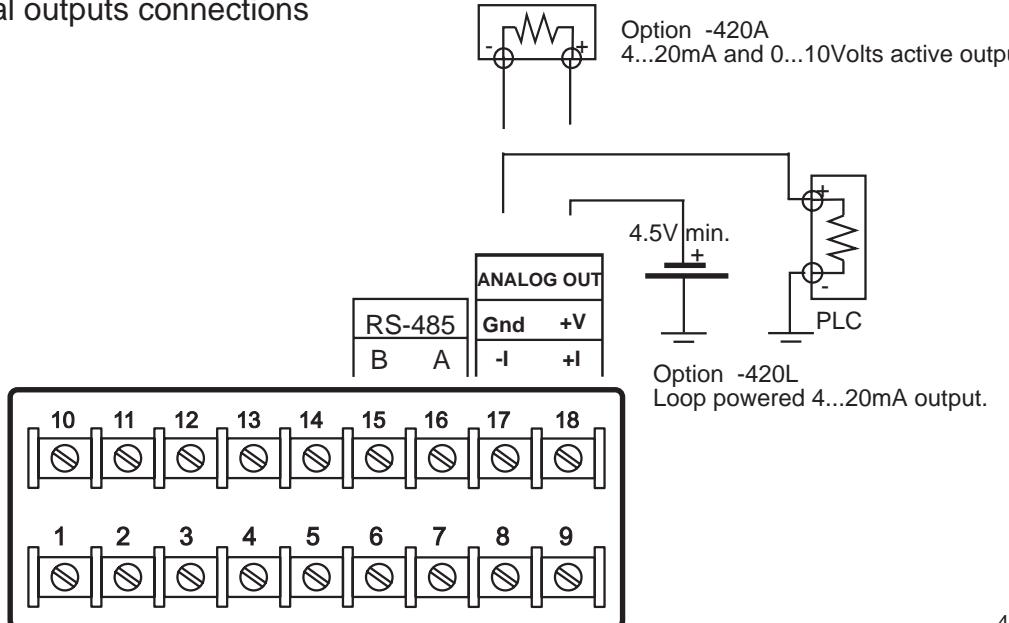
Set "Si" for programming new data. Otherwise data will be lost when quitting this menu.

S A L i

= No, Si

Set "Si" for quitting this menu. Otherwise return back to its starting point.

Optional outputs connections



Analog output option variables for the FL40

M. r t E
V. r t E

Mass flow rate.
Volumetric flow rate.

Serial RS485 communications configuration.

Serial rs485 communications are optional, although the configuration menu is in all the instruments, hardware for its operation could not be installed. The command description for the communications protocol is available as file in internet (www.arian.cl) and includes tag listing with its properties and scales.

Characteristics : - RS485 physical protocol with optically isolated interface.

- start bit, 8 data bits, parity bit = 0, stop bit
- communication protocol, Modbus RTU ,functions 03, 06, 10

The questions in the configuration menu are the following.

n o d E o F F, oN
Enable or disable communications.

b A u d 300, 600, 1200, 2400, 3600, 4800, 9600, 19.2k
Communication speed.

n. S c L = 1...247
Slave number.

P r o g = No, Si
Set "Si" for programming new data. Otherwise data will be lost when quitting this menu.

S A L i = No, Si
Set "Si" for quitting this menu. Otherwise return back to its starting point.

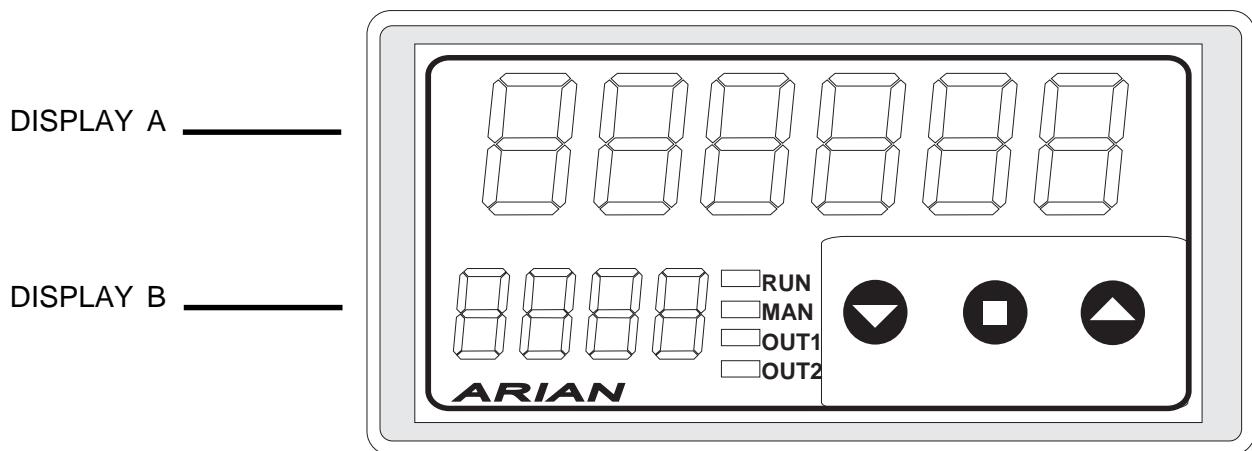
Modbus RTU available variables.

This variables are available for inspection with a RS485 interface and the ArianOPC server
Download from www.arian.cl the ArianOPC server, follow instalation guide and open the fl40b.ars file to have instantaneus readings of this internal registers.

Address	Data type		Units	Description
H400000	Real4	ReadOnly	User_Units	Mass Flow Rate in User Units
H400160	Real4	ReadOnly	Kg/seg	Mass Flow Rate in MKS units
H4001b0	Real4	ReadOnly	User_Units	Volumetric Flow Rate in user units
H400190	Real4	ReadOnly	m3/seg	Volumetric Flow Rate in MKS units
H4001a0	Real4	ReadOnly	Kg/m3	instantaneus fluid density
H400168	Real4	ReadOnly	Kelvin	Input temperature
H400170	Real4	ReadOnly	Pascal	P1 input absolute presure
H400178	Real4	ReadOnly	Pascal	dP input
H400198	Real4	ReadOnly		Cdischarge x Expansion factor
H4001c8	Real4	ReadOnly		Custom table output
H400150	Integer4	ReadOnly		Mass totalizer
H400158	Real4	ReadOnly		Mass totalizer pre-scale
H4001b8	Integer4	ReadOnly		Volume totalizer
H4001c0	Real4	ReadOnly		Volume totalizer pre-scale
H400010	Integer2	Read/Write		main set point
H400020	Integer2	Read/Write		
H400030	Integer2	Read/Write		
H400040	Integer2	Read/Write		
H400050	Integer2	Read/Write		
H400060	Integer2	Read/Write		
H4000D0	UnSignIntg2	ReadOnly	0-100%	Analog Output
H400100	Integer4	ReadOnly	Celsius	Temperature input
H400110	Integer4	ReadOnly	0-100% sensor	P1 analog input
H400118	Integer4	ReadOnly	0-100% sensor	dP analog input
H400120	Real4	ReadOnly	User_Units	Maximum registered flow rate
H400128	Real4	ReadOnly	User_Units	Minimum registered flow rate
H401000	String8	ReadOnly		identification

OPERATION

The location of the front panel buttons can be seen in the figure. The central button [•] is the main one, is used for selecting and entering parameters. Lateral buttons are used to increase or decrease selected parameter.



Activated alarm

Leds "OUT 1" and " OUT 2" reflect alarm relays state (activated or deactivated) . Once an alarm (AL- or AL-2) is activated, the lower display reading starts blinking (1 time/2 seconds) for advising the operator that a alarm condition has occurred.

Special reset functions.

If these functions are enabled from the general configuration menu, is possible to reset the maximums, minimum, latched alarms or disable momentarily the relay outputs by pressing one of the front panel buttons [^] or [v].

Access to special functions and registers.

For entering to the menu press the center button [•], immediately one of 2 submenus should be selected by means of the lateral buttons and finally press again the center button [•] to enter the selected sub-menu.

r E A d Examine parameters values.

F u n c Reset functions and outputs disable.

While you are within this menus, the instruments continues measuring the flow rate.

Sub-menu r E A d , examine parameter values.

This menu only permits to examine (not to modify) the values of some internal parameters.

With lateral buttons you can scan parameters. Pressing central button returns to normal operation mode.

<u>M. r t E</u>	Mass flow rate reading in defined engineering units
<u>M A C S</u>	Maximum registered mass flow rate .
<u>M i n i</u>	Minimum registered mass flow rate .
<u>V. r t E</u>	Volumetric flow rate reading in defined engineering units.
<u>M. t o t</u>	Totalized mass flow rate.
<u>V. t o t</u>	Totalized volumetric flow rate.
<u>t. i n</u>	Input temperature in degrees celius.
<u>P. i n</u>	Input pressure as 0... 100% of the sensor scale.
<u>dP. i n</u>	Differential pressure as 0... 100% of the sensor scale.
<u>S P. r E</u>	Shows general Set Point for alarms configured with relative set points.

Sub-menu F u n c , reset maximum, minimum, disabling outputs.

This menu can be locked from the configuration menu, in that case the upper display shows the message L o c k.

Once entering this Sub-menu can be selected one of the following special functions that will be executed immediately.

<u>r S t . N</u>	Resets registered maximum and minimum of Flow rate.
<u>r S t . A</u>	Resets latched alarms.
<u>d i . A L</u>	Disables momentarily and enables the relay outputs. If outputs are momentarily disabled by this function, the RUN led in front panel blinks rapidly.
<u>r S t . C</u>	Resets (returns to cero) both the mass and volumetric totalized flows. Once a function is selected with the lateral buttons press central button [\bullet], and will be executed in the instantaneously and instrument returns back to normal operation mode. If no button is press in 16 seconds, the instruments exits menu.

Modify alarms Set Points.

IMPORTANT NOTE

Once entering this menu the instrument stops integrating the process variable and will start doing it again when you exit the menu.

To enter the menu press the center button [•] and without releasing it, press and release one time the "right or upper" button [^]. Doing that, the message "KEY" will appear in the upper display. At this moment the instrument asks for a access key. Now the number 1234 should be introduced in the lower display and then pressed the button [•] to enter.

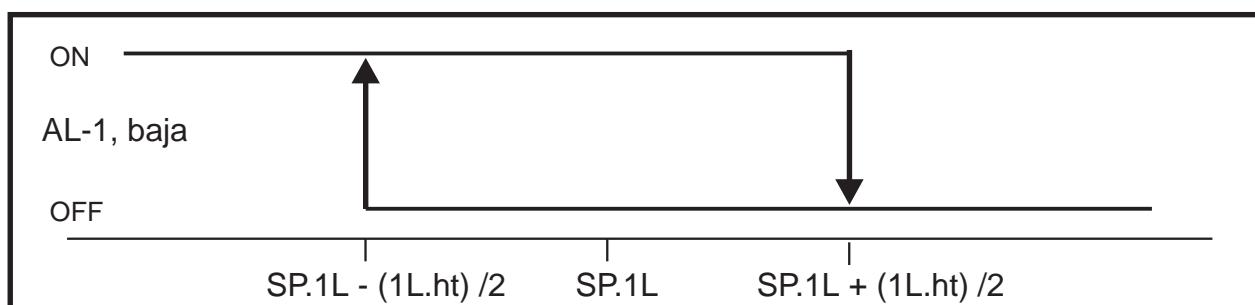
The FL40 possesses 2 independent alarms (AL-1 and AL-2) each one associated to a output relay and can be linked to totalized flow or to the flow rate.

Each alarm possesses a high and low set points.

When the measured variable is lower to the low set point or higher to high set point, the alarm and its corresponding relay is activated.

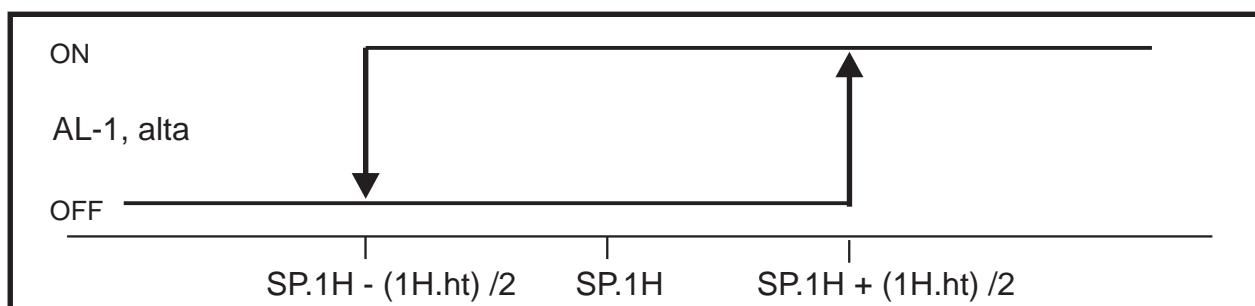
For example the alarm-1, low has a set point SP.1L that can be obtained in two different ways depending if it was configured as absolute (onFh) or relative (donF) in the alarm configuration menu.

$$\begin{array}{ll} \text{SP.1L} = \text{S P. r E} - \text{1. L . d S} & \text{case } \underline{\text{donF}} \\ \text{SP.1L} = \text{1. L . S P} & \text{case } \underline{\text{onFh}} \end{array}$$



In the same way for high alarm-1 :

$$\begin{array}{ll} \text{SP.1H} = \text{S P. r E} + \text{1. H . d S} & \text{case } \underline{\text{donF}} \\ \text{SP.1H} = \text{1. H . S P} & \text{case } \underline{\text{onFh}} \end{array}$$



This menu is different depending if you have chosen to associate the alarm to the totalized flow or to the flow rate.

Also depends on the enabled options in the configuration menu.

Alarm-1, associated to flow rate.

If alarm AL-1 or AL-2 or both are enabled as relative alarms, the is required to set:

S P. r E = -999,... 9999

General Set Point used in calculation of alarm operation point, only for alarms configured as relative (d o n F) .

This parameter is asked only if some alarm was set as d o n F , other case is omitted.

Alarm-1, High

According on value H i g h for AL-1 configuration, the following cases will be given :

Case o F F Nothing is asked, high alarm is disabled.

Case onFh

1. H . SP = -999,... 9999

Set Point for AL-1 high. Becomes active when:

Flow rate > 1. H . SP Considering hysteresis.

1. H . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-1 high.

Case donF

1. H . dS = -999,... 9999

Alarm-1 high activation point separation referred to **S P. r E** .

Will become active when:

Flow rate > S P. r E + 1. H . d S Considering hysteresis.

1. H . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-1 high.

Alarm-1, Low

According on value L o w for AL-1 configuration, the following cases will be given :

Case o F F Nothing is asked, low alarm is disabled.

Case onFh

1. L . SP = -999,... 9999

Set Point for AL-1 low. Becomes active when:

Flow rate < 1. L . SP Considering hysteresis.

1. L . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-1 low.

Case donF

1. L . dS = -999,... 9999

Alarm-1 low activation point separation referred to **S P. r E**.

Will become active when:

Flow rate < **S P. r E** - **1. L . d S** Considering hysteresis.

1. L . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-1 low.

Alarm-2, flow rate associated.

Alarm-2, High

Depending on value of H i g h for AL-2 configuration, the following cases will be given:

Case o F F Nothing is asked, high alarm is disabled.

Case onFh

2. H . SP = -999,... 9999

Set Point for AL-2 high. Becomes active when:
Flow rate > 2. H . SP Considering hysteresis.

2. H . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-2 high.

Case donF

2. H . dS = -999,... 9999

Alarm-2 high activation point separation referred to S P. r E.
Will become active when:
Flow rate > S P. r E + 2. H . d S Considering hysteresis.

2. H . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-2 high.

Alarm-2, Low

Depending on value of L o w for AL-2 configuration, the following cases will be given:

Case o F F Nothing is asked, low alarm is disabled.

Case onFh

2. L . SP = -999,... 9999

Set Point for AL-2 low. Becomes active when:
Flow rate < 2. L . SP Considering hysteresis.

2. L . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-2 low.

Case donF

2. L . dS = -999,... 9999

Alarm-2 low activation point separation referred to S P. r E.
Will become active when:
Flow rate < S P. r E - 2. L . d S Considering hysteresis.

2. L . ht = 0... 999

Hysteresis for the activation and deactivation of the AL-2 low.

Alarm-1 associated to totalized flow.

Alarm-1, High

Depending on value of H i g h for AL-1 configuration, the following cases will be given:

Case o F F Nothing is asked, high alarm is disabled.

Case onFh

Set Point for AL-1 high is active when:

Totalized flow > SP

Set point is entered in 2 parts, first the 4 less significant digits and then the 2 most significant in order to have a 6 digit number for SP.

1.H.S.4 = 0,... 9999

1.H.S.4 = 0,... 99

Alarm-1, Low

Depending on value of L_o_w for AL-1 configuration, the following cases will be given:

Case o F F Nothing is asked, low alarm is disabled.

Case onFh

Set Point for AL-1 high is active when:

Totalized flow < SP

Set point is entered in 2 parts, first the 4 less significant digits and then the 2 most significant in order to have a 6 digit number for SP.

1.L.S.4 = 0,... 9999

1.L.S.4 = 0,... 99

Alarm-2 associated to totalized flow.

Is configured in the same way as explained for Alarm-1, high and low.